## Chapter VII

# Hazardous Waste Management

### Overview

Mexico generates a total of approximately eight million tons of liquid and solid hazardous waste per year, but only an estimated 12 percent it is disposed of properly. The remainder is stored at manufacturing plants or illegally dumped in municipal sewage systems, landfills, rivers, and clandestine dumps.[1] Hazardous wastes produced by *maquiladoras* are required to be returned to the country of origin of the materials from which the waste is derived. The U.S.-Mexico Hazardous Waste Tracking System (Haztraks) was created jointly by the U.S. Environmental Protection Agency (EPA) and the Mexican National Environmental Institute (Instituto Nacional de Ecología–INE) and is responsible for monitoring hazardous wastes that are shipped across the border.[2] According to Haztraks data, Mexico exported approximately 11,000 tons of hazardous waste to the United States in 1997. This number differs significantly from data provided by the Secretariat of Environment, Natural Resources, and Fisheries (Secretaría de Medio Ambiente, Recursos Naturales y Pesca–SEMARNAP),[3] due to differences in regulatory definitions of hazardous waste in either country. According to SEMARNAP's data, 31,828 tons of hazardous materials from sources other than *maquiladoras* were exported to the United States for treatment or confinement whereas 51,704 tons had to be returned from Mexico to the United States by *maquiladoras*.[4] NAFTA's Article 303 changed the classification of the *maquiladora* program in 2001, which has affected the restrictions that require hazardous waste from *maquiladoras* to be returned to the country of origin. By 2005, or perhaps even sooner, the shipment across the border of hazardous waste generated in *maquiladoras* will no longer be required.

The existing infrastructure for hazardous waste management is limited and insufficient for processing the waste generated by Mexico's expanding

economy and growing industrial sector. One of the reasons behind improper disposal of hazardous waste is a shortage of disposal and confinement facilities.[5] For example, the only Mexican-approved hazardous waste facility for the Baja California border region is in Monterrey, Nuevo León, several states away from the source.

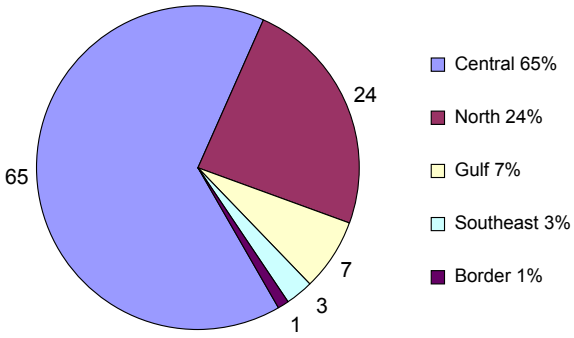


Figure 1: Total Generation of Hazardous Waste in Mexico by Region: 8 Million Tons[6]

The 1988 General Law of Ecological Balance and Environmental Protection (Ley General del Equilibrio Ecológico y la Protección al Ambiente–LGEEPA) defines a substance as hazardous waste according to its particular physical and chemical properties. The Spanish acronym CRETIB refers to the characteristics that define waste as hazardous: corrosive, reactive, explosive, toxic, flammable, or biological-infectious. No distinction is made between hazardous wastes and materials. It is important to point out that Mexico defines hazardous waste differently than the United States. In some cases, standards for what is considered hazardous are more stringent in Mexico than they are in the United States. California, however, has stricter standards than the U.S. federal government.

The INE is a subagency of the Secretariat of Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales–SEMARNAT) that is in charge of the Hazardous Waste National Register. In 2000, only 8 percent of the generators were registered, but it is the Fox administration's goal

to have the register fully updated by 2006.[7] According to INE's Hazardous Waste National Register in 2000, there were 75 companies in Baja California Sur and 124 companies in Baja California listed as producing hazardous waste.[8] The INE is also responsible for authorizing private companies to collect, recycle, incinerate, treat, and dispose of hazardous waste.

Also under SEMARNAT, the Federal Attorney General for Environmental Protection (Procuraduría Federal de Protección al Ambiente–PROFEPA) is in charge of environmental inspection and enforcement. According to PROFEPA, only 51.8 percent of Mexico's hazardous waste-generating facilities, 43.9 percent of its management companies, and 58.1 percent of the generators of biological-infectious waste were in compliance with the environmental regulations in 2001.[9] The Ministry of Communications and Transportation (Secretaría de Comunicaciones y Transportes–SCT) is responsible for issuing transportation licenses for chemical substances and hazardous wastes.

## Plans and Projects

While the problem of hazardous waste management has long been neglected, it is now a higher priority in SEMARNAT. As Environmental Minister Víctor Lichtinger points out, while hazardous waste generation is constantly increasing, the infrastructure for its confinement and the treatment is not. Thus, it is crucial to strengthen the legal framework and increase the capacity of the authorities responsible for inspection and vigilance.[10]

### *Hazardous Waste Management Plan*

In 1996, the Mexican government implemented the Program for Minimization and Management of Hazardous Industrial Waste in Mexico (Programa para la Minimización y Manejo de Residuos Industriales Peligrosos en México 1996–2000) for the period through the year 2000. The program was designed to promote waste reduction and recycling, reduce risks inherent in the handling of hazardous waste, encourage cleaner processes by upgrading technology, reduce the use of raw materials through recycling, and encourage

the development of a new industrial sector. The program also identified a list of the most polluting cities and industrial areas, of which the U.S.-Mexican border region was a part.[11] Several sites in Tijuana are listed as highly contaminated due to the improper disposal of lead.[12] Citizen complaints and increasing public concern about the health effects of these sites may lead to site remediation efforts at these locations in the near future.

The 1996–2000 program included the development of Integrated Centers for the Management and Utilization of Industrial Wastes (Centro Integral de Manejo y Aprovechamiento de Residuos Industriales–CIMARI) run by the private sector. They offer solvent recovery and recycling services, hazardous waste storage, incineration services, and wastewater treatment according to the needs of the region. According to INE, the Baja California peninsula was not an initial target of the CIMARI program.

In 1999, the United States and Mexico signed an agreement regarding hazardous waste facilities. This agreement called for a "consultative mechanism" in which both countries would publicly disclose all existing and planned hazardous waste facilities that lie within 62 miles (100 kilometers) of their joint borders. Hazardous and radioactive waste disposal sites are listed as well as recycling, treatment, and incineration facilities. An inventory listing the facilities in Baja California that fall under the new arrangement follows in Annex A.

In addition, Baja California's environmental authorities, in collaboration with SEMARNAT, plan to build a hazardous waste facility that would treat the waste generated by Baja California's *maquiladoras*. Although the facility is expected to be completed by 2004, a site has not been identified yet.[13]

**Soil Remediation**

The market for remediation of contaminated soil is definitely incipient. The undeveloped domestic market for soil remediation technology offers significant opportunities for U.S. companies. Because most environmental studies in Mexico have focused on water and air, there is limited knowledge about the flow, final

destination, and effects that hazardous waste has on soil.[14] Within hazardous waste management, the focus is on the confinement, handling, and transportation of hazardous waste and less so on services related to remediation. As border residents become more aware of potential health effects of contaminated sites, it is likely that government agencies will move forward with soil remediation projects.

Due largely to the significant expansion of *maquiladora* manufacturing facilities in Mexico and rapidly growing U.S.-Mexican bilateral trade since NAFTA, the quantities of hazardous materials moving through U.S. and Mexican border communities has increased significantly in recent years. This has raised concerns in Mexican and U.S border communities about the potential threat of hazardous spills as hazardous materials are transported or stored throughout the region. Led by the Border XXI Hazardous and Solid Waste Workgroup, U.S. and Mexican agencies at all levels have cooperated to develop emergency response plans for twin cities along the border. Such a plan for the Douglas, Arizona-Agua Prieta, Sonora, region has been completed. Currently, Science Applications International Corporation (SAIC) has a contract to develop an emergency response plan for the Tijuana-San Diego region. There are no emergency response plans for other areas along the California-Baja California border.

**Mexico as a Potential Market**

Because the infrastructure for the treatment of hazardous waste is so limited in Mexico, its market offers significant potential for investment. However, there are some obstacles to overcome, including the lack of community acceptance of the need for hazardous waste landfills and incineration sites and the consequent difficulty in obtaining the permits to build them. The prices for confinement, recycling, and treatment of hazardous waste are much lower in Mexico than in the United States. However, operational costs are very much the same in both countries.

The most important end-users in the public sector for hazardous waste infrastructure include PEMEX, the government-owned petroleum company, and

the Federal Electricity Comission (Comisión Federal de Electricidad–CFE). Main users in the private sector are chemical, rubber, plastic, oil, and coal derivative companies that often store their waste in drums at their facilities. Other potential end-users are in the electronics, textiles, leather, non-metallic, and basic metallic industries. The mining sector is an important end-user in other parts of Mexico, but not in Baja California or Baja California Sur. As Mexico's tracking and enforcement improves in the years ahead, the demand for this infrastructure will increase.

According to the International Trade Administration of the U.S. Department of Commerce, the best sales prospects for U.S. companies in the remediation market are the following:[15]

- Services for the detection of contaminated sites
- Services for the elimination of sources of contamination
- Customized engineering proposing feasible remediation technologies and other services
- Remediation technologies themselves, such as chemicals for bioremediation, sandblasting equipment, air and water separators, gas extraction equipment, cleansing agents, drilling equipment, laboratory and analytical equipment and services, among others
- Engineering services for the implementation of spill prevention and control programs
- Risk analyses for different materials and facilities, administrative controls, contingency plans, training, and so forth.

A list with the best sales prospects according to the International Trade Administration of the U.S. Department of Commerce is included in Annex B.

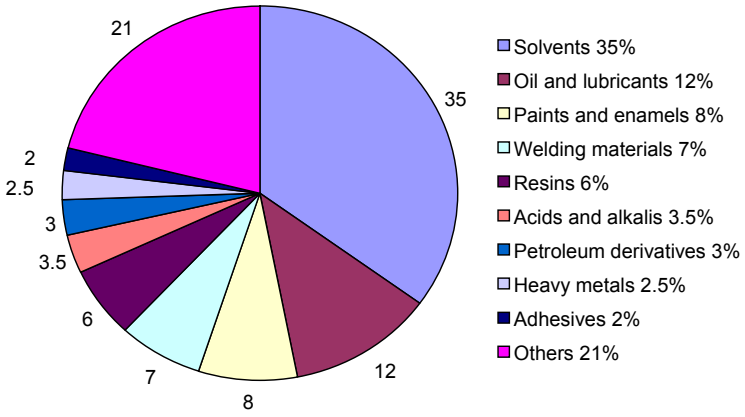


Figure 2: Products as a Source of Hazardous Waste[16]

## Annex A[17]

***Hazardous and Radioactive Waste Facilities Covered under the "Consultative Mechanism" in Baja California (October 2001)***[18]

| Facility | Location | Type of Waste(s) | Treatment (T)/ Storage (S)/ Recycler (R) |
|---|---|---|---|
| **a) Commercial facilities that treat or dispose of hazardous waste generated off-site** | | | |
| Bio-Infex Servicios y Tecnología, S.A. de C.V. | Tijuana | Sterilization of biological waste | T |
| Técnicas Medioambientales Winco, S.A. de C.V. | Tijuana | Sterilization of biological waste | T |
| Dryer Technology de México, S. de R.L. | Tijuana | Flammable solid and liquid wastes | T |
| **b) Commercial facilities that recycle hazardous waste generated off-site** | | | |
| Industrias de Grasas y Derivados, S.A. de C.V. | Tijuana | Recycling of spent lubricant oil | R |
| Industrias P. Kay de México, S.A. de C.V. | Tijuana | Recycling of tin-lead solder | R |
| Nueva Exportadora Latina de México, S.A. de C.V. | Mexicali-Tijuana | Recycling of spent lubricant oil | R |
| Óxidos y Pigmentos Mexicanos, S.A. de C.V. | Tijuana | Recycling of non-ferrous metals, smelting; recovery of lead oxide from used batteries | R |
| Recicladora Temarry de México, S.A. de C.V. | Mexicali-Tijuana | Recycling of spent solvents | R |
| Servicios Ecológicos Gal, S.A. de C.V. | Tijuana | Recycling of 200-liter metal and plastic drums; recycling of textile material contaminated with grease, oil, and solvents | R |
| Solver, S.A. de C.V. | Tijuana | Recycling of acidic and alkaline aqueous solutions, used solvents, contaminated oils, and paint wastes | R |
| Cementos Guadalajara, S.A. de C.V. | Ensenada | Recycling of alternate fuels and used oils | R |

| Facility | Location | Type of Waste(s) | Treatment (T)/ Storage (S)/ Recycler (R) |
|---|---|---|---|
| **c) Commercial facilities that temporarily store hazardous waste generated** | | | |
| Gonhermex, S.A. de C.V. | Tijuana | Used automobile batteries | S |
| Great Western de México, S.A. de C.V. | Tijuana | Copper chloride solder in solid and liquid state | S |
| Industrias Crown Chemical, S.A. de C.V. | Tijuana | Empty containers that contained hazardous materials and wastes | S |
| Pacific Treatment Environmental Services, S.A. de C.V. | Tijuana | Acidic wastes, paints, metals, asbestos, used oil, and solid wastes; flammable solids, spent oils, acidic and alkaline solutions, halogenized solvents, resins, insecticides, flammable liquids and metals; flammable and toxic liquids and solids | S |
| Procesos Industriales Cachanilla, S.A. de C.V. | Mexicali | Hazardous wastes (no PCBs) | S |
| STR de México, S.A. de C.V. | Tijuana | Contaminated, toxic, and flammable liquids and solids, except PCBs and bioinfectious wastes | S |
| Sessa, S.A. de C.V. | Tijuana | Flammable wastes and organic peroxides, empty drums, PTAR sludge, electroplating sludge, rags, filters, glass, and plastic contaminated with sludge and/or oil, metal slag, flammable solids | S |
| Sistemas Ecológicos para la Protección Ambiental, S.A. de C.V. | Tijuana | Contaminated solids and liquids | S |
| Servicios Ambientales Mexicanos, S.A. de C.V. | Tijuana | Alkaline, corrosive, flammable, acidic, and toxic wastes; liquid and solid alkaline and corrosive wastes; flammables, acids, and toxic wastes | S |
| Técnicas Medioambientales Winco, S.A. de C.V. | Tijuana | Biological waste | S |
| Protectora Ambiental y Ecológica de México, S.A. de C.V. | Tijuana | Liquid and solid waste from x-rays, film, photographic negatives, and toner and fixer waste | S |

| Facility | Location | Type of Waste(s) | Treatment (T)/ Storage (S)/ Recycler (R) |
|---|---|---|---|
| Enertec México S. de R. L. de C.V. | Tijuana | Used batteries | S |

## Annex B[19]

***Best Sales Prospects for Hazardous Industrial Waste Equipment Market:***

- Polymer deposits
- Filtration membranes
- Corrosive liquid containers
- Condensing crystallizers and refrigerators
- Enameled containers
- Other steel containers/deposits
- Burners
- Industrial autoclaves
- Refining turbinators
- Fiber crushers
- Blade-crushing machines
- Hammer or percussion crushers
- Garbage compactors
- Mixers, crushers, mills
- Tubular catalytic reactors
- Special vehicles
- Bulk transport containers
- Industrial ovens

## References

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[16] Instituto Nacionál de Ecología (INE). 2001. "Programa para la Minimización y el Manejo Integral de los Residuos Industriales Peligrosos en México. 1996–2000. Generación por tipo de residuos." (Cited 6 March 2002), http://www.ine.gob.mx/upsec/ programas/prog_rip/gen-est.htm.
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